progesterone

The ovaries secrete two classes of hormones: estrogens and progestins; estradiol is the most important of the estrogens, and progesterone is the dominant progestin. In the nonpregnant female, essentially all of the estrogen compounds are secreted from the ovaries, with only minute amounts being synthesized in the adrenal cortex. Nearly all of the progesterone in nonpregnant females is produced in the corpus luteum; only small amounts are formed in the mature follicle during the day immediately before ovulation.

Functions of Progesterone

The Most Important Function of Progesterone Is to Promote Secretory Changes in the Uterine Endometrium During the Latter Half of the Monthly Sexual Cycle. This prepares the uterus for implantation of the zygote. Progesterone has a similar effect on the lining of the fallopian tubes, causing secretion of the fluid that provides nutrition for the fertilized ovum during its passage to the uterus. The hormone also reduces the excitability and motility of the uterine smooth muscle.

Progesterone Stimulates Development of the Lobules and Alveoli of the Breasts. This effect causes the alveolar cells to enlarge, proliferate, and become secretory in nature, although the cells do not produce milk in response to progesterone.

Progesterone Causes an Upward Resetting of the Body Temperature Control System by About 0.5° F. This effect can be used to determine the time of ovulation because progesterone is not produced until the preovulatory LH surge, which takes place a few hours before ovulation.

Monthly Endometrial Cycle and Menstruation

Driven by the cyclic production of ovarian hormones, the endometrium goes through a monthly cycle characterized by three phases: (1) proliferation, (2) development of secretory changes, and (3) menstruation.

The Proliferative Phase Is Initiated by Secretion of Estrogen from the Developing Follicles. At the beginning of each cycle, most of the endometrium has been lost during menstruation, and only a thin layer of basal endometrial stroma remains. The only remaining epithelial cells are located in the crypts of the endometrium and in the deep portions of the endometrial glands. Estrogen secreted from the developing follicles during the early portion of the cycle stimulates rapid proliferation of the stromal and epithelial cells. The entire endometrial surface is re-epithelialized within 4 to 7 days of the beginning of menstruation. During the next 10 days, the stimulatory effects of estrogen cause development and thickening of the endometrium of up to 4 mm.

The Secretory Phase Results from Changes Brought About by Progesterone. After ovulation, the corpus luteum secretes large amounts of progesterone and estrogen. The effect of the progesterone is to cause swelling and secretory development of the endometrium. The glands secrete fluid, and the endometrial cells accumulate lipids and glycogen in their cytoplasm. The vascularity of the endometrium continues to develop in response to the requirements of the developing tissue. At the peak of the secretory phase, at 1 week after ovulation, the endometrium is approximately 6 mm thick.

Menstruation Follows within 2 Days of Involution of the Corpus Luteum. Without the stimulation of the estrogen and progesterone secreted by the corpus luteum, the endometrium rapidly involutes, to about 65% of its previous thickness. Then, starting approximately 24 hours before menstruation, the blood vessels supplying the endometrium become vasospastic, resulting in ischemia and finally necrosis of the tissue. Hemorrhagic areas develop in the necrotic tissue, and gradually the outer layers separate from the uterine wall. At about 48 hours after the start of menstruation, all the superficial layers of the endometrium are desquamified. Distention of the uterine cavity, elevated levels of prostaglandin E2 released from the ischemic and necrotic tissue, and low levels of progesterone contribute to stimulation of uterine contractions, which expel the shed tissue and blood. The menstrual fluid is normally nonclotting resulting from the presence of fibrinolysin released from the endometrial tissue.